7.0 Natural Resources

This chapter provides background information on the natural resources associated with the Fernald site and summarizes the activities in 2004 relating to these resources. Included in this chapter is a discussion of the following:

- Threatened and endangered species
- Impacted habitat areas
- Ecological restoration activities
- Cultural resources.

Much of the 1,050 acres (425 hectares) of the Fernald site property is undeveloped land that provides habitat for a variety of animals and plants. Wetlands, deciduous and riparian (stream side) woodlands, old fields, grasslands, and aquatic habitats are among the site's natural resources. Some of these areas provide habitat for state and federal endangered species. Cultural resources, such as prehistoric archaeological sites, can also be found at the Fernald site. Monitoring of these natural and cultural resources is addressed in the Natural Resource Monitoring Plan, which is included in the IEMP. This document presents an approach for monitoring and reporting the status of several priority natural resources in order to remain in compliance with the pertinent regulations and agreements.

7.1 Threatened and Endangered Species

Sloan's Crayfish - The state-listed threatened Sloan's crayfish (*Orconectes sloanii*) is found in southwest Ohio and southeast Indiana. It prefers streams with constant (though not necessarily fast) current flowing over rocky bottoms. A large, well-established population of Sloan's crayfish is found at the Fernald site in the northern reaches of Paddys Run.

Indiana Brown Bat - The federally listed endangered Indiana brown bat (*Myotis sodalis*) forms colonies in hollow trees and under loose tree bark along riparian (stream side) areas during the summer. Excellent habitat for the Indiana brown bat has been identified at the Fernald site along the wooded banks of the northern reaches of Paddys Run. The habitat provides an extensive mature canopy of older trees and water throughout the year. One Indiana brown bat was captured and released on property in August of 1999.

Running Buffalo Clover - The federally listed endangered running buffalo clover (*Trifolium stoloniferum*) is a member of the clover family whose flower resembles that of the common white clover. Its leaves, however, differ from white clover in that they are heart-shaped and a lighter shade of green. Running buffalo clover has not been identified at the Fernald site; however, because running buffalo clover is found nearby in the Miami Whitewater Forest, the potential exists for this species to become established at the site. The running buffalo clover prefers habitat with well-drained soil, filtered sunlight, and limited competition from other plants and periodic disturbance. Suitable habitat areas include partially shaded grazed areas along Paddys Run and the Storm Sewer Outfall Ditch.

Spring Coral Root - The state-listed threatened spring coral root (*Corallorhiza wisteriana*) is a white and red orchid that blooms in April and May, and grows in partially shaded areas of forested wetlands and wooded ravines. This plant has not been identified at the Fernald site; however, suitable habitat exists in portions of the northern woodlot.

The Endangered Species Act requires the protection of any federally listed threatened or endangered species, as well as any habitat critical for the species' existence. Several Ohio laws mandate the protection of state-listed endangered species as well. Since 1993 a number of surveys have been conducted to determine the presence of any threatened or endangered species at the Fernald site. As a result of these surveys, the federally endangered Indiana brown bat and the state-threatened Sloan's crayfish have been found at the Fernald site. In addition, suitable habitat exists at the site for the federally endangered running buffalo clover and the state-threatened spring coral root. Neither of these species has been found on the property, but their habitat ranges encompass the site. Figure 7-1 shows the habitats and potential habitats of these species. Based on provisions set forth in the IEMP, any threatened or endangered species habitat will be surveyed prior to any remediation or restoration activities. If threatened or endangered species are present, appropriate avoidance or mitigation efforts will be undertaken. No surveys were conducted in 2004.

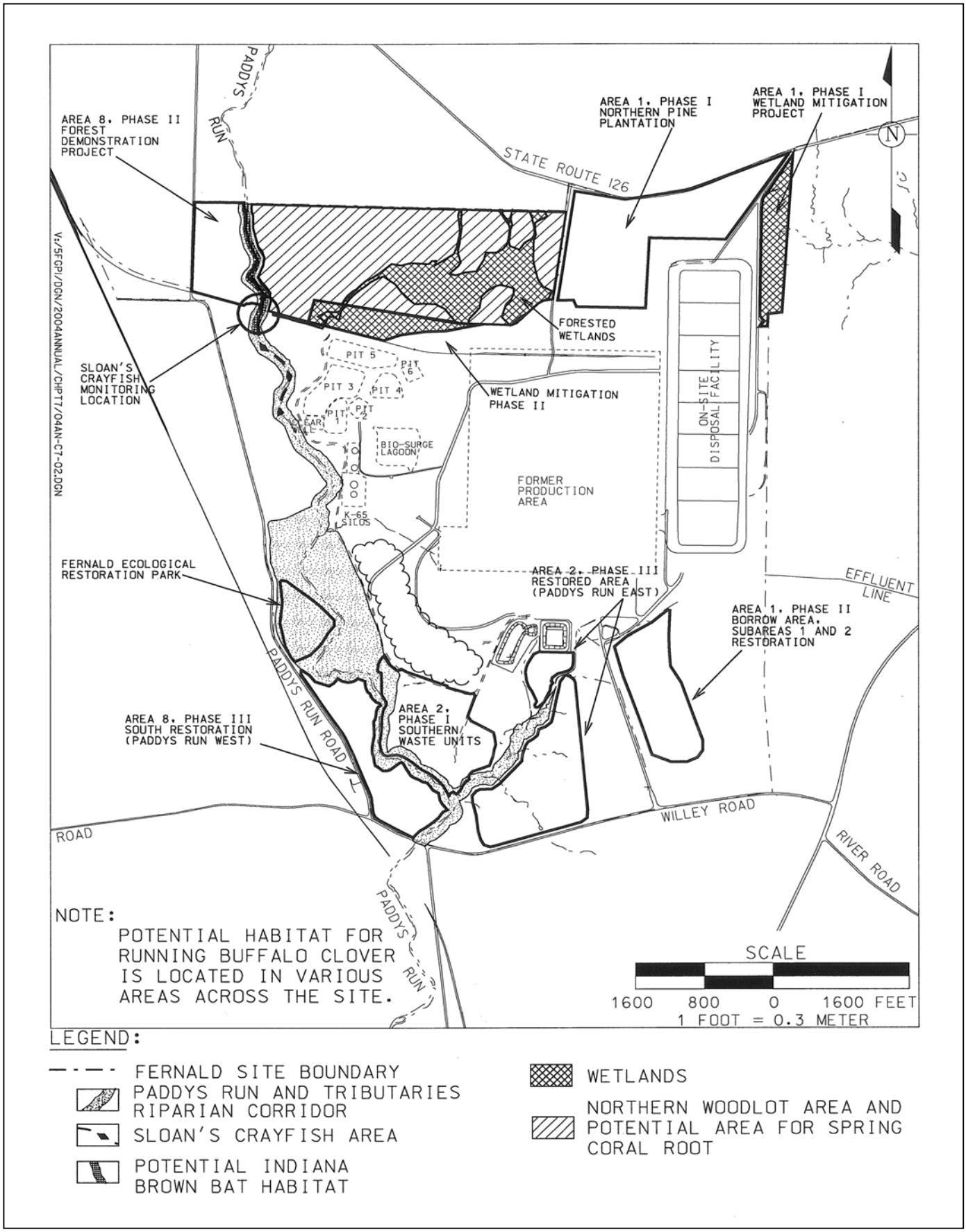

Figure 7-1. Priority Natural Resource Areas

7.1.1 Sloan's Crayfish Monitoring and Provisions for Protection

A Sloan's crayfish survey was conducted in August 2001 in order to determine if there were any impacts following debris removal near Paddys Run in Area 1 (Phase III). The survey results from the 2001 sampling effort demonstrated that the Paddys Run Sloan's crayfish population was not impacted by the debris removal operation. A large number of individuals were observed both downstream and upstream of the project area. Researchers did note a general decline in the ratio between Sloan's crayfish and *Orconectes rusticus*, which is a larger, more aggressive crayfish species that often competes with the Sloan's crayfish. Similar trends are observed statewide, and are attributed to the aggressive nature of *Orconectes rusticus*.

The IEMP originally required that visual field inspections of sediment loading be conducted within one day of a "significant rain event," which is considered to be 0.5 inch (1 cm) or more of rain in one 24-hour period. The purpose of this field-inspection monitoring is to determine if there is an increase of sediment in the northern reaches of Paddys Run due to remediation activities. Sediment loading can adversely impact the Sloan's crayfish by restricting its ability to "breathe" in water. If remediation activities cause sustained (four to five days) increased sediment loading to Sloan's crayfish habitat in Paddys Run, alternatives such as crayfish relocation are considered. Figure 7-1 identifies the Sloan's crayfish monitoring location.

The Sloan's crayfish monitoring program was suspended in 2002 because construction activities in the area decreased and episodes of increased sediment loading were rare. However, the program was resumed briefly in February 2003 due to railyard expansion activities and again in November 2003 when grading activities for the Wetland Mitigation Project (Phase II) commenced. Turbidity monitoring continued until June 2004, once the Wetland Mitigation Project (Phase II) was completed. No instances of increased sediment loading were observed during 2004 monitoring efforts.

7.2 Impacted Habitat

DOE and the Natural Resource Trustees tentatively agreed that it would not be necessary to quantitatively assess habitat impacted through remediation because DOE will be conducting natural resource restoration on approximately 884 acres (358 hectares) of the site. Therefore, a summary of the year's habitat impacts is presented here.

About 0.5 acre of riparian (stream side) habitat was disturbed along the Great Miami River in order to remove a portion of the abandoned outfall line. Vegetation consisted mostly of weedy, non-native species. The area was reseeded with a native grass and wildflower mix once field activities were completed.

7.3 Ecological Restoration Activities

For 2004, ecological restoration of the Wetland Mitigation Project (Phase II) was completed; Paddys Run West and the borrow area continued; and Paddys Run East was initiated. These projects are described in more detail below and are identified on Figure 7-1. Figure 7-1 also shows the location for previous restoration projects implemented at the Fernald site. Ecological restoration monitoring activities for several projects also continued in 2004.

The Wetland Mitigation Project (Phase II) involved the restoration of an 8-acre (3.2-hectare) former borrow area north of the waste pits. Three shallow basins were constructed and planted with a variety of wetland grasses, sedges, rushes, and wildflowers. Water enters the basins from adjacent wetlands of

the Northern Woodlot. Water control structures are used to regulate the depth of water within each basin. The Wetland Mitigation Project (Phase II) will contribute about 5 acres (2 hectares) toward the site wetland mitigation requirements. In 2004, grading of the basins and spillways was completed, and the water control structures were installed. Approximately 1,700 trees and shrubs were planted across the project area. In wetland areas, about 1,600 herbaceous plants were installed as well. Clearing of invasive plants in the Northern Woodlot was undertaken to prepare for tree planting and seeding. Invasive plants are non-native species that can quickly overtake an area by out-competing native vegetation for available resources. For instance, bush honeysuckle aggressively invades semi-shaded woodlands and forest edges. These shrubs grow so dense that native wildflowers, shrubs, and tree seedlings cannot get enough light to survive. As a result, native plant diversity is severely reduced and secondary succession (the process of natural habitat regeneration) is permanently altered. Field personnel use several methods to clear invasive species: mowing, cutting, pulling, and/or spraying with herbicide.

The Paddys Run West restoration project encompasses Area 8 (Phase III) South and North. Restoration objectives involve converting former pastures into tallgrass prairies and expanding the forested corridor along Paddys Run. In 2004, over 1,100 trees and shrubs were planted east of Paddys Run Road. Also, roughly nine acres of tallgrass prairie were seeded within Area 8 (Phase III) South. Work will continue in 2005 with the completion of planting and seeding across the remainder of the project area.

Borrow area restoration involves the creation of wetlands and tallgrass prairies across the southeast portion of the Fernald site. Grading and seeding for Sub-areas 1 and 2 of this project was completed in 2003. In 2004, tree and shrub installation for this area was initiated. Additional grading, vegetation installation, and seeding will be conducted in 2005.

The Paddys Run East restoration project involves the enhancement and expansion of existing forested areas along the southern on-property portion of Paddys Run and its tributaries. The project area encompasses all of Area 2 (Phases II and III). In addition to forest restoration, several tallgrass prairies will be seeded. In 2004, restoration activities focused on plant installation within Area 2 (Phase III). Approximately 1,300 trees and shrubs were installed across the project area. Work will continue in 2005 with additional tree and shrub planting, prairie seeding, and clearing of invasive species.

Ecological restoration monitoring has been divided into two phases: the Implementation Phase and the Functional Phase. Implementation Phase monitoring is conducted to ensure that restoration projects are completed as intended in their designs. This effort involves the mortality counts and herbaceous cover estimates that are conducted after a project is completed. Functional Phase monitoring is more general and considers projects in terms of their contribution to the ecological community as a whole. This is accomplished by comparing projects to pre-remediation baseline conditions and to ideal reference sites. Mortality and herbaceous cover thresholds are described in the 2002 Consolidated Monitoring Report for Restored Areas at the Fernald Closure Project (DOE 2003b).

In 2004, implementation monitoring was conducted for the Northern Pine Plantation restoration project. Mortality counts and herbaceous cover estimates were calculated across the project area. Overall plant survival within the Northern Pines is approximately 70 percent. As with other projects, plant survival was primarily influenced by deer pressure. Portions of the Northern Pines are protected with deer exlosure fencing. In these areas, survival was much better than surrounding areas, at around 85 percent. These findings have resulted in the increased use of deer exclosure fencing across the Fernald site. Herbaceous cover estimates for the Northern Pine Plantation demonstrated that native grasses and wildflowers have quickly established within the restored area.

Functional Phase monitoring at the Fernald site involved the characterization of restored prairie and savanna communities. Upland prairie vegetation in the Area 1 Wetland Mitigation Project (Phase I), the Area 8 Forest Demonstration Project (Phase II), and the Eco Park Prairie were compared to baseline and reference sites. Each of these areas showed considerable progress. In general, the diversity and quality of native vegetation present in these restored areas is much improved when compared to baseline conditions. In 2005, several restored forest areas will be evaluated.

A family of hooded mergansers makes the Area 1 Wetland Mitigation Project (Phase I) their home.

7.4 Cultural Resources

The Fernald site and surrounding area are located in a region of rich soil and many sources of water, such as the Great Miami River. Because of its advantageous location, the area was settled repeatedly throughout prehistoric and historic time, resulting in richly diverse cultural resources. In summary, 148 prehistoric and 40 historic sites have been identified within 1.24 miles (2 km) of the Fernald site.

Several laws have been established to protect cultural resources during remedial activities at the Fernald site. The National Historic Preservation Act requires DOE to take into consideration the effects of its actions on sites that are listed or eligible for listing on the National Register of Historic Places. The Native American Graves Protection and Repatriation Act requires that prehistoric human remains and associated artifacts be identified and returned to the appropriate Native American tribe.

To comply with these laws, DOE conducts archeological surveys prior to remediation activities in undeveloped areas of the Fernald. Figure 7-2 shows that the majority of the site has been surveyed. These surveys have resulted in the identification of six sites that may be eligible for listing on the National Register of Historic Places. None of these sites was impacted by remediation activities and no additional surveys were needed in 2004.

DOE also keeps track of unexpected discoveries of cultural resources during remediation activities at the Fernald site. One prehistoric and nine historic artifacts were encountered in 2004. None of the findings was significant, and no impacts to cultural resources occurred. Due to the proximity of several known cultural resource sites, monitoring was conducted during excavation of the abandoned outfall line. Most of the historic artifacts were found during this project. They consisted primarily of ceramic stoneware. The prehistoric artifact was a piece of pottery uncovered during borrow area operations in Area 1 (Phase II).

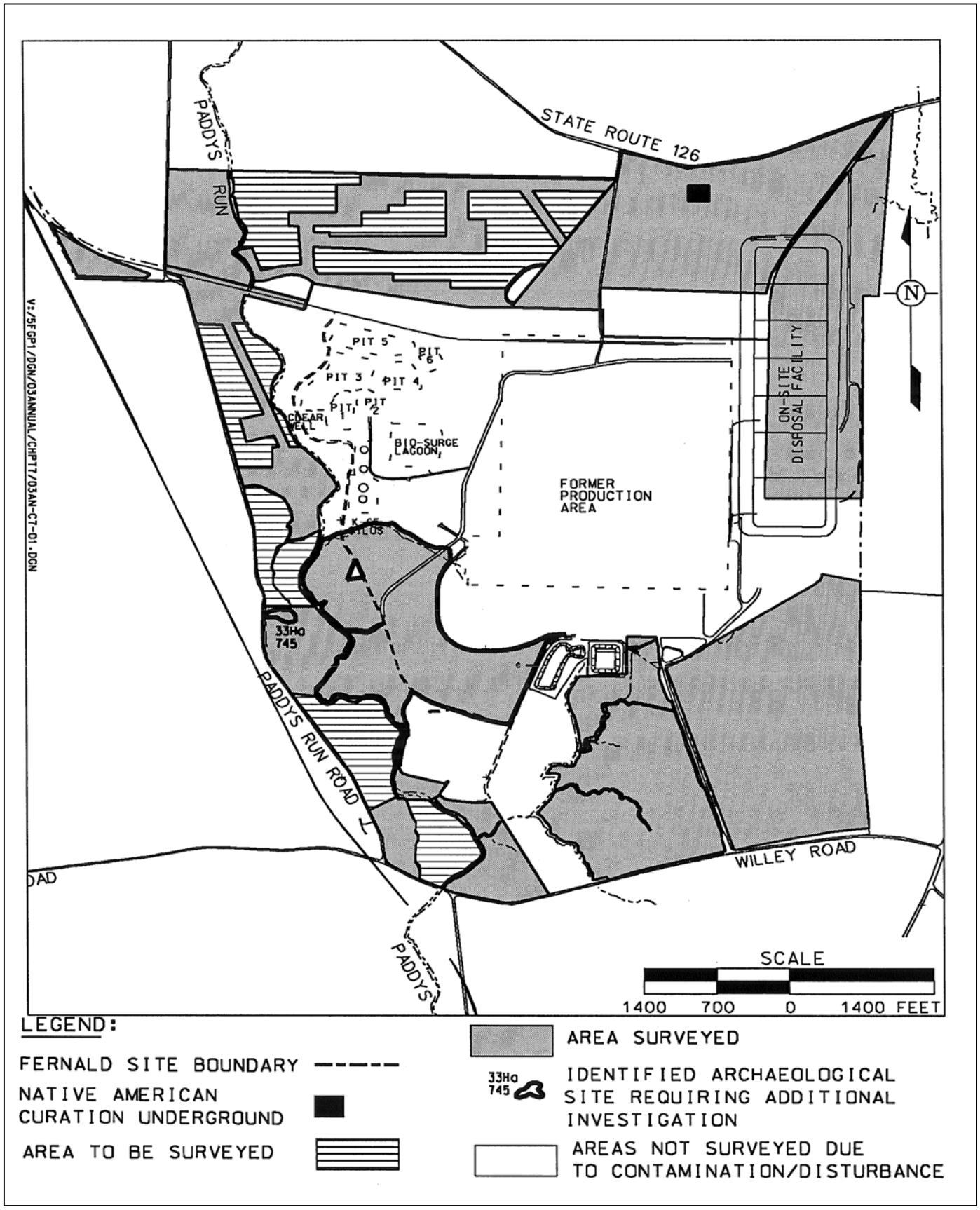

Figure 7-2. Cultural Resource Survey Areas